VARIETY RESPONSE TO VERTICILLIUM WILT AND BACTERIAL BLIGHT IN THE SOUTHERN HIGH PLAINS OF TEXAS

Terry A. Wheeler
Jane K. Dever
Texas A&M AgriLife Research
Lubbock, TX
Cecilia Monclova-Santana
Texas A&M AgriLife Extension Service
Lubbock, TX

Abstract

Small plot cultivar trials were planted in two fields naturally infested with *Verticillium dahliae*. The objective was to determine which cultivars demonstrated the best combination of low wilt incidence, low defoliation, and high yield and fiber quality. At the Plainview location, which had significant damage from Verticillium wilt, FM 2334GLT, DP 2123 B3XF and FM 2202GL was among the best in terms of low wilt incidence, high yield, and high value/acre. At the Ropesville location (which also contained root-knot nematode), no cultivar met the criteria for having low wilt incidence and defoliation and high yields. The cultivars with the highest yield and value/acre were FM 2498GLT, ST 4993B3XF, PHY 411 W3FE (which is root-knot nematode resistant), and ST 5091B3XF. *Xanthomonas citri* pv. *malvacearum* race 18 (causes bacterial blight) was sprayed over the top of a small plot cultivar trial and rated for disease incidence. There was a range from 0 to 100% incidence among the cultivars. Phytogen maintains 100% resistance to blight in all cultivars with W3FE technology. FiberMax is the second best with 90% of it's available cultivars resistant to bacterial blight.

Introduction

Verticillium wilt (caused by *Verticillium dahliae*) is one of the most impactful diseases of cotton in the Southern High Plains of Texas. The fungus produces a structure called microsclerotia in dying plants that can survive in the soil for many years. This structure will germinate in response to plant exudates and moisture and can infect cotton roots that pass closely to the microsclerotia. The severity of Verticillium wilt is a function of microsclerotia density, but also of environmental conditions. For cotton planted in May, cool temperatures with adequate moisture in July and early August will trigger an early onset of severe Verticillium wilt including high disease incidence. Temperatures in late August and September (and adequate moisture) are necessary to have significant defoliation. Yield is substantially reduced in the presence of Verticillium wilt. However, fiber quality is also affected, including lower micronaire and an increase in short fiber content.

Bacterial blight (caused by *Xanthomonas citri* pv. *malvacearum*, race 18 [Xcm]) is a sporadic disease in the U.S. If the bacteria are present in a field, then rain and wind can start an epidemic if a susceptible variety is grown. When the majority of cotton acres are planted to Xcm susceptible varieties, then eventually outbreaks will occur. The initial outbreaks may be initiated by infected planting seed, if Xcm were not already present in the field. It is important to continue to plant cotton varieties that include resistance to Xcm.

Materials and Methods

Verticillium Wilt

Verticillium wilt plots (35-foot-long) were two rows wide on 40-inch centers, and each entry was replicated four times in a randomized complete block design. A test was planted near Plainview, TX on 21 May, which had 36 entries, and a test was planted near Ropesville, TX that had 40 entries. Wilt incidence was measured by counting the (total number of plants exhibiting symptoms of Verticillium wilt divided by the total number of plants in the plot) x 100. Wilt incidence was measured in the Plainview site on 11 August and on 31 September for the test near Ropesville. Defoliation was measured at 20 locations in each plot. At each location, the plants were given a rating from 0 to 4, where 0 = no defoliation, 1 = defoliation in the bottom third of the plants (1-33%), 2 = defoliation above the bottom 1/3 of the plant and below the top 1/3 of the plant (34-66%), 3 = defoliation in the top 1/3 of the plant (67-99%), and 4 = 100% defoliation. The percent defoliation was calculated by taking the midpoint of each of the ranges and averaging those for each plot. Defoliation was measured on three dates for the Plainview site, and the one taken on 9 September will be presented. Defoliation was measured on 22 September for Ropesville. The tests were

harvested with a 2-row cotton planter, modified to weight the stripped cotton in a cage on load cells. Samples were ginned to determine turnout. The Plainview site was harvested on 11 November and Ropesville site was harvested on 15 and 16 November. Plot samples were ginned to determine turnout and lint was sent to the Texas Tech Fiber and BioPolymer Research Institute for HVI testing. Value/acre was calculated by yield x loan value. Cultivar responses were analyzed by analysis of variance using PROC GLM in SAS (version 9.4, SAS Institute, Cary, NC) and means were separated with a Waller-Duncan k-ratio t-test (P=0.05).

Bacterial Blight

Two row plots (30-foot-long) were planted with entries, arranged in a randomized complete block design with four replications. The plots were sprayed with *X. citri* pv. *malvacearum* (race 18) on 4 August. The bacterial concentration was 10^6 colony forming units (cfu)/ml water, and it was applied at a rate of 50 gal/acre. Silwet L77 was added to the tank at a rate of 0.2% v/v. The bacteria were grown in trypticase soy broth for 1 ½ days and then diluted to 10^6 cfu/ml to apply to the field. The field was rated for disease incidence on 22 August. Data was analyzed with analysis of variance, similar to described above.

Results and Discussion

Plainview: Verticillium wilt was highly damaging at this site in 2021. To recommend a cultivar, it should be in the "**A**" group (represented in bold) for wilt incidence, defoliation, yield, and value/acre. FM 2334GLT, DP 2123 B3XF, and FM 2202GL were the top three performing cultivars considering all attributes of disease and yield (Table 1). DP 1822 XF was ranked 4th in terms of overall performance and was the second highest yielding variety. It has slightly higher disease ratings than are desired. PHY 205 W3FE was the 5th best overall performer but had a lower loan value than some of the other top performers. Micronaire was a problem for some cultivars (Table 2) which lowered their loan values substantially. The order of cultivars presented in Table 1 is by value/acre. For every 1% of wilt, lint yield was reduced by an average of 4 lbs./acre ($2.31/acre, based on loan value). For every 1% defoliation, yield was reduced by an average of 6.9 lbs./acre ($3.9/acre, based on loan value).

Ropesville: No cultivar met the criteria for being in the "A" group for wilt, defoliation, yield, and value/acre (see bolded values, Table 3). Verticillium wilt incidence was low overall ranging from 5 to 29% (Table 3). Defoliation was adequate to separate out susceptibility to Verticillium wilt between cultivars. The cultivars with the least defoliation were PHY 394 W3FE, FM 2334GLT, NG 4050 XF, and NG 5150 B3XF. The cultivars with the highest yield and value/acre were FM 2498GLT, ST 4993B3XF, PHY 411 W3FE (new variety from Phytogen), and ST 5091B3XF. Only one of these are root-knot nematode resistant (PHY 411 W3FE), so from a disease standpoint, it is difficult to relate disease resistance (either to Verticillium wilt or root-knot nematode) with higher yields. This field does have root-knot nematode present, though not at high densities. It is likely that the defoliation occurred late enough in September that it had minimal impact on yield. Micronaire was a problem for some cultivars (Table 4) which lowered their loan values substantially. The order of cultivars presented in Table 3 is by value/acre.

Bacterial blight: The test included two checks: DP 2123 B3XF (partially susceptible) and DP 1646 B2XF (partially resistant). There were nine tested entries that were highly susceptible to bacterial blight (95 to 100% incidence), including Brownfield Seed and Delinting (BS&D) 4X, BS&D Ton Buster Magnum, NG 3195 B3XF, NG 4190 B3XF, and NG 5150 B3XF (Table 5). The moderately susceptible cultivars were BS&D Ton Buster Elite and ST 4595B3XF. BS&D 9X was partially resistant. Resistant varieties included BS&D 224, DP 2012 B3XF, DP 2020 B3XF, DP 2022 B3XF, DP 2044 B3XF, NG 4050 XF, NG 3299 B3XF, NG 5711 B3XF, NG 3930 B3XF, and NG 4098 B3XF. Based on this testing methodology and using company ratings, when no data were available, a list of the percentage of susceptible and resistant cultivars for companies were compiled (Table 6).

.

Table 1. Effect of Verticillium wilt on cultivars in a trial near Plainview, TX.

Variety	Plants /ft row	% Wilt	% Defol-iation	Lint Yield (lbs./a)	Value $/a	Loan Value $/lb.	Turn Out %
DP 1822 XF	2.74	43.8	46.9	**1,172**	**672.49**	0.5738	27.66
FM 2202GL	2.19	**33.6**	36.2	**1,199**	**666.18**	0.5558	32.27
FM 2334GLT	2.69	**21.7**	**16.7**	**1,143**	**659.37**	0.5770	29.36
DP 2123 B3XF	3.05	**34.5**	**25.9**	**1,131**	**633.84**	0.5603	26.26
DP 2012 B3XF	2.95	**33.3**	43.2	1,065	**607.50**	0.5705	29.55
DP 1820 B3XF	2.08	42.3	38.3	1,050	**606.40**	0.5778	30.24
PHY 205 W3FE	3.04	36.4	37.9	1,093	587.49	0.5375	29.14
DP 2022 B3XF	2.45	49.9	**17.8**	1,060	537.95	0.5075	26.95
FM 1621GL	2.28	40.4	46.9	938	536.67	0.5723	30.60
FM 2398GLTP	2.19	53.0	49.4	943	533.08	0.5653	30.67
PHY 350 W3FE	2.79	**30.5**	44.4	1,066	529.55	0.4970	28.98
PX3E33W3FE	2.91	**31.9**	50.0	944	527.56	0.5590	26.06
DP 2020 B3XF	2.80	42.7	52.3	935	525.47	0.5620	28.80
AR 9371 B3XF	2.61	46.4	59.6	926	519.49	0.5610	29.54
NG 3500 XF	1.45	61.8	34.2	1,034	518.91	0.5018	29.25
PHY 250 W3FE	2.38	38.1	39.4	987	513.65	0.5205	26.59
NG 3195 B3XF	2.44	**35.2**	56.5	889	504.63	0.5678	28.39
AR20XT9B3XF	3.20	**34.2**	50.2	887	499.06	0.5628	31.22
FM 1730GLTP	2.37	46.4	33.8	973	498.83	0.5128	27.25
BX2296B3XF	2.17	37.5	**29.4**	861	486.01	0.5648	32.31
NG 3930 B3XF	2.66	**25.1**	39.4	1,004	477.52	0.4755	26.37
PHY 210 W3FE	3.18	40.5	44.6	960	470.09	0.4898	28.82
ST 5091 B3XF	2.40	38.8	64.2	871	465.77	0.5350	30.03
AR21XW2XF	2.26	**24.2**	57.0	892	455.81	0.5110	27.71
NG 3956 B3XF	2.76	**29.4**	45.4	883	455.42	0.5160	26.12
DP 1909 XF	2.06	50.7	38.6	826	429.31	0.5200	26.01
ST 4595B3XF	2.35	47.4	37.3	762	428.02	0.5620	29.41
ST 4480B3XF	2.58	46.6	48.6	827	426.15	0.5153	25.80
DP 2115 B3XF	2.43	43.1	41.1	723	394.97	0.5463	28.77
BX2298B3XF	2.33	45.4	62.4	728	383.15	0.5263	30.20
DP 1612 B2XF	2.76	51.5	66.7	723	381.34	0.5278	26.17
ST 4990B3XF	2.61	**32.6**	67.8	659	361.06	0.5483	27.01
NG 3299 B3XF	1.84	56.1	67.2	624	339.50	0.5445	26.06
ST 4993B3XF	2.01	49.1	63.7	632	330.35	0.5225	28.67
NG 2982 B3XF	2.45	42.1	57.8	775	311.01	0.4013	27.61
BX2297B3XF	2.13	44.1	69.1	476	242.78	0.5103	25.59
Prob>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.013
MSD[1] (0.05)	0.33	13.5	15.1	131	70.84	0.0471	

[1]MSD is minimum significant difference (*P*=0.05).

Table 2. Fiber properties for cultivars in a Verticillium wilt trial near Plainview, TX

Variety	Mic[2]	Length	Unif.	Strength	Elon.	Rd	+b	Leaf	Color
AR20XT9B3XF	3.73	1.12	79.40	29.10	7.0	83.1	8.0	1.0	11-1, 21-1
AR21XW2XF	3.32	1.17	80.60	30.00	7.8	81.5	7.2	4.0	21-2, 31-1
AR 9371 B3XF	3.69	1.10	81.00	26.65	6.4	83.2	7.7	2.0	11-2, 21-1
BX2296B3XF	4.35	1.11	80.30	27.60	6.6	82.7	8.1	1.0	11-2, 21-1
BX2297B3XF	3.58	1.07	79.85	25.20	6.6	81.2	8.1	2.5	21-1, 21-2
BX2298B3XF	3.76	1.05	79.70	26.30	6.5	82.1	8.0	2.0	11-2, 21-1
DP 1612 B2XF	3.29	1.12	80.70	28.70	6.8	81.2	7.7	2.5	21-1, 31-1
DP 1820 B3XF	3.87	1.16	80.50	31.00	5.9	82.9	7.5	2.0	21-1
DP 1822 XF	3.70	1.15	81.00	31.20	6.2	82.7	7.6	2.0	11-2, 21-2
DP 1909 XF	3.24	1.18	81.70	31.05	6.0	84.3	6.7	3.0	21-1, 21-2
DP 2012 B3XF	3.53	1.14	80.90	28.45	6.0	82.8	8.0	2.5	11-1, 21-1
DP 2020 B3XF	3.56	1.12	79.50	27.70	6.0	83.1	7.7	1.5	11-2, 21-1
DP 2022 B3XF	3.39	1.09	78.95	27.15	6.0	81.9	6.7	3.5	31-1
DP 2115 B3XF	3.57	1.09	79.45	27.55	7.1	81.6	7.7	3.5	21-1, 21-2
DP 2123 B3XF	3.61	1.13	79.55	29.10	5.8	81.7	7.6	3.5	21-1, 31-1
FM 1621GL	3.58	1.14	82.10	29.90	5.6	81.5	7.4	4.0	21-2
FM 1730GLTP	3.20	1.19	82.45	32.95	5.8	82.8	7.1	3.5	21-1, 21-2
FM 2202GL	3.74	1.10	80.60	31.90	6.6	81.0	8.0	3.5	21-1
FM 2334GLT	3.76	1.19	81.20	30.40	6.0	83.2	7.4	2.0	21-1
FM 2398GLTP	3.50	1.11	80.60	28.80	6.3	81.7	7.6	2.5	21-1, 31-1
NG 2982 B3XF	2.66	1.08	80.45	29.35	6.4	78.2	6.8	6.0	41-1
NG 3195 B3XF	3.87	1.13	81.00	27.90	5.9	81.1	7.3	3.0	11-2, 31-2
NG 3299 B3XF	3.41	1.16	81.95	32.15	6.1	82.5	7.8	1.5	11-2, 21-2
NG 3500 XF	3.27	1.10	80.60	30.50	7.2	80.5	8.3	2.5	21-1, 31-1
NG 3930 B3XF	2.99	1.12	79.50	27.10	6.7	80.9	8.0	4.0	21-1, 31-1
NG 3956 B3XF	3.34	1.09	79.95	28.80	7.0	81.9	8.2	3.0	11-2, 21-1
PHY 205 W3FE	3.50	1.08	82.15	31.25	6.0	79.4	7.0	5.0	21-2, 41-1
PHY 210 W3FE	3.24	1.09	80.60	31.25	5.8	82.8	7.0	3.0	21-2
PHY 250 W3FE	3.29	1.11	79.75	30.05	5.9	80.5	6.9	5.0	21-2, 41-1
PHY 350 W3FE	3.31	1.11	79.20	27.70	6.8	82.3	7.7	2.5	21-1, 21-2
PX3E33W3FE	3.53	1.12	80.20	29.60	6.6	81.4	8.2	2.5	11-2, 21-1
ST 4480B3XF	3.37	1.14	79.60	28.15	6.1	83.7	6.4	2.0	21-2, 31-1
ST 4595B3XF	3.55	1.13	79.70	27.75	6.8	82.0	7.7	3.0	21-1, 21-2
ST 4990B3XF	3.50	1.16	81.70	27.25	6.8	83.4	7.4	2.0	11-2, 21-1
ST 4993B3XF	3.33	1.12	81.80	32.50	6.8	83.1	8.1	1.5	11-1, 11-2
ST 5091B3XF	3.48	1.10	79.75	29.40	6.5	81.6	8.2	2.0	21-1
Prob>F	0.0001	0.0001	0.0004	0.0001	0.0001	0.04	0.0001	0.013	
MSD[1] (0.05)	0.41	0.05	1.66	1.93	0.5	3.6	0.6	2.8	

[1]MSD is minimum significant difference (P=0.05).
[2]Mic=micronaire; Unif = uniformity, Elong = strength.

Table 3. Effect of Verticillium wilt and root-knot nematode (RK) on cultivars in a trial near Ropesville.

Variety	Plants /ft row	% Wilt	% Defoli-ation	Lint Yield (lbs./a)	Value $/a	Loan Value $/lb.	Turn Out %	RK[1] rating
FM 2498GLT	3.36	13.7	23.6	**1,629**	**933.95**	0.5735	27.89	S
ST 4993B3XF	2.59	21.8	50.0	**1,516**	**870.35**	0.5743	30.32	S
PHY 411 W3FE	3.58	**5.5**	37.5	**1,587**	**863.92**	0.5398	27.80	R
ST 5091B3XF	3.02	13.1	55.7	**1,663**	**857.78**	0.5158	31.06	S
NG 3299 B3XF	2.41	23.9	55.7	1,482	**857.49**	0.5788	30.61	S
DP 2127 B3XF	2.84	15.4	57.8	1,495	849.15	0.5468	30.87	S
DP 1820 B3XF	2.96	11.7	46.1	1,500	848.40	0.5778	29.71	S
PHY 332 W3FE	3.47	**9.7**	25.9	1,501	832.07	0.5433	26.10	R
DP 1612 B2XF	3.26	16.7	51.5	**1,518**	831.12	0.5415	25.97	S
NG 4050 XF	2.79	**5.2**	**9.7**	**1,618**	821.62	0.5078	26.60	S
AR 9831 B3XF	2.94	25.8	41.3	**1,574**	820.42	0.5443	29.24	S
DP 2038 B3XF	3.09	18.9	34.6	**1,570**	813.39	0.5180	28.95	S
FM 2334GLT	3.16	**4.7**	**8.7**	1,465	784.39	0.5503	26.87	S
PHY 350 W3FE	3.41	12.9	23.0	1,416	777.25	0.5490	25.55	PR
DP 2141NR B3XF	3.27	**8.1**	28.7	**1,537**	776.06	0.5050	28.83	R
BX2296B3XF	2.99	18.3	44.4	1,349	775.55	0.5748	29.68	S
NG 5150 B3XF	2.84	**8.9**	**19.5**	1,476	774.09	0.5370	28.33	S
ST 5600B2XF	3.08	**8.7**	26.9	**1,528**	770.75	0.5045	25.59	R
AR21XR2B3XF	3.10	15.3	24.2	1,480	758.59	0.5023	28.12	S
PHY 400 W3FE	3.36	**8.3**	35.6	1,431	739.51	0.5318	26.18	PR
PX3E33W3FE	3.36	11.8	42.1	1,426	728.48	0.5143	25.85	R
NG 4190 B3XF	3.04	24.8	47.5	1,456	723.34	0.5068	27.15	S
PHY 443 W3FE	3.44	11.6	25.7	1,318	719.15	0.5303	24.31	R
ST 4946GLB2	3.34	11.8	39.6	1,416	716.86	0.4980	25.07	PR
PHY 394 W3FE	3.30	**4.9**	**6.4**	1,426	707.13	0.4958	24.00	R
ST 4990B3XF	3.19	15.0	52.0	1,334	703.82	0.5273	26.57	S
DP 2143NR B3XF	3.29	**8.0**	29.6	1,225	699.60	0.5468	25.80	R
AR20XT9B3XF	3.68	13.1	37.7	1,370	698.56	0.5170	27.47	S
BX2297B3XF	2.95	16.1	38.6	1,264	686.08	0.5430	27.34	S
ST 5707B2XF	3.22	16.3	64.2	1,240	645.55	0.5205	24.65	S
ST 4480B3XF	3.16	20.1	53.5	1,247	634.42	0.5220	24.24	S
DP 1845 B3XF	2.84	13.5	42.1	1,240	626.69	0.5055	25.49	S
NG 4098 B3XF	3.18	15.3	22.0	1,261	626.16	0.4935	25.76	S
DP 2055 B3XF	2.76	22.4	68.9	1,214	622.78	0.5130	25.55	S
PHY 480 W3FE	3.32	15.4	39.0	1,345	621.73	0.4668	25.50	R
DP 2044 B3XF	3.09	19.9	32.6	1,288	619.65	0.4810	25.14	S
DP 1840 B3XF	2.88	15.4	37.5	1,204	611.14	0.5078	26.50	S
ST 4595B3XF	2.97	28.7	47.5	1,183	602.87	0.5095	26.03	S
NG 4936 B3XF	2.60	21.9	67.2	1,088	590.16	0.5423	25.43	S
PHY 545 W3FE	3.42	**7.6**	29.3	1,202	584.18	0.4885	24.61	R
Prob>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.027	4.78	
MSD[2] (0.05)	0.23	6.7	14.9	151	77.88	0.0791	0.006	

[1]RK=root-knot nematode ratings where S=susceptible, R=resistant, PR=partially resistant.
[2]MSD is minimum significant difference (P=0.05).

Table 4. Fiber properties for a variety test near Ropesville.

Variety	Mic.[2]	Length	Unif.	Strength	Elon.	Rd	+b	Leaf	Color
AR20XT9B3XF	3.26	1.18	81.15	30.35	7.7	85.2	7.5	2.5	11-1
AR21XR2B3XF	3.10	1.12	80.60	29.65	6.4	85.0	7.0	2.5	11-2, 21-1
AR 9831 B3XF	3.73	1.13	80.95	29.10	7.8	84.4	7.7	3.0	11-1, 11-2
BX2296B3XF	3.52	1.16	82.80	29.80	7.2	84.9	7.6	2.0	11-1
BX2297B3XF	3.42	1.12	81.45	27.35	7.3	84.1	7.6	2.5	11-2
DP 1612 B2XF	3.47	1.17	81.50	29.90	8.0	82.9	7.6	4.0	21-1
DP 1820 B3XF	3.78	1.17	81.60	30.65	7.1	83.0	7.6	2.5	11-1, 21-2
DP 1840 B3XF	3.16	1.18	81.00	29.30	7.5	84.9	7.8	1.5	11-1, 11-2
DP 1845 B3XF	3.04	1.21	79.65	29.90	7.8	84.8	6.6	3.5	21-1, 21-2
DP 2038 B3XF	3.48	1.10	80.75	27.65	7.2	80.0	7.5	1.0	11-1, 41-2
DP 2044 B3XF	2.72	1.20	79.60	31.80	6.3	82.5	7.6	3.5	21-1, 21-2
DP 2055 B3XF	3.17	1.18	80.00	28.30	7.6	85.6	7.3	2.0	11-1, 11-2
DP 2127 B3XF	3.63	1.14	82.30	28.80	7.1	85.2	7.4	1.5	11-1
DP 2141NR B3XF	3.17	1.15	79.90	29.85	7.0	83.6	7.6	3.0	11-2, 21-1
DP 2143NR B3XF	3.40	1.15	81.65	29.70	7.1	84.6	7.2	3.0	11-2, 21-1
FM 2334GLT	3.50	1.23	81.80	28.80	6.5	86.0	7.0	2.0	11-1, 11-2
FM 2498GLT	3.57	1.15	81.00	28.45	6.6	84.6	7.1	2.5	21-1
NG 3299 B3XF	3.80	1.16	83.25	32.15	6.7	84.6	7.8	1.5	11-1, 11-2
NG 4050 XF	3.19	1.16	81.45	29.65	7.2	83.4	7.5	2.5	11-2, 21-1
NG 4098 B3XF	2.98	1.19	79.35	31.70	6.6	81.9	7.2	4.5	21-2, 31-1
NG 4190 B3XF	3.12	1.16	80.95	28.65	7.0	85.6	7.1	1.5	11-1
NG 4936 B3XF	3.28	1.22	82.25	29.65	7.4	86.4	6.8	2.5	11-1
NG 5150 B3XF	3.32	1.14	81.25	28.20	7.3	84.7	7.3	2.5	11-1, 11-2
PHY 332 W3FE	3.29	1.19	81.70	30.80	7.0	84.0	7.8	2.0	11-1, 11-2
PHY 350 W3FE	3.36	1.16	81.85	29.40	7.2	85.1	7.1	2.0	11-1, 21-2
PHY 394 W3FE	2.90	1.20	80.10	29.55	6.5	82.8	7.2	3.5	21-1, 21-2
PHY 400 W3FE	3.24	1.20	81.90	30.35	6.9	84.9	7.2	2.0	11-1, 21-1
PHY 411 W3FE	3.57	1.12	82.40	31.05	7.4	84.8	7.3	2.5	11-2, 21-1
PHY 443 W3FE	3.14	1.17	81.85	30.20	6.9	83.3	7.4	3.0	11-1, 21-2
PHY 480 W3FE	2.81	1.14	81.95	28.80	7.9	83.9	7.5	3.0	11-1, 21-1
PHY 545 W3FE	2.95	1.12	81.80	29.25	7.3	84.8	7.2	1.5	11-2
PX3E33W3FE	3.23	1.14	80.90	30.20	7.1	83.7	7.9	3.0	11-1, 21-1
ST 4480B3XF	3.38	1.16	80.50	29.70	6.4	82.8	8.2	2.5	11-2, 1-3
ST 4595B3XF	3.29	1.16	79.95	28.80	7.4	83.2	7.1	3.5	21-1, 31-1
ST 4946GLB2	3.08	1.12	81.95	29.70	7.6	82.8	7.9	3.0	11-2, 21-1
ST 4990B3XF	3.27	1.17	82.90	30.35	7.0	84.6	7.2	2.0	11-1, 21-1
ST 4993B3XF	3.77	1.14	82.70	31.05	7.5	83.7	7.8	4.0	11-1, 21-1
ST 5091B3XF	3.29	1.18	81.55	28.15	6.6	85.9	7.1	2.0	11-1, 11-2
ST5600B2XF	3.13	1.15	80.90	30.50	7.3	84.0	7.6	2.5	11-1, 21-1
ST5707B2XF	3.19	1.17	82.55	31.60	7.1	83.3	7.9	2.0	11-1, 21-1
MSD[1] (0.05)	0.003	0.0001	0.0001	0.0001	0.0001	0.336	0.258	0.618	
Prob>F	0.58	0.03	1.43	1.91	0.6				

[1]MSD is minimum significant difference (*P*=0.05).
[2]Mic=micronaire; Unif = uniformity, Elong = strength.

Table 5. Bacterial blight incidence for cultivars tested in an inoculated trial in 2021.

Designation	Blight %	Type
Brownfield Seed and Delinting BS&D 4X	100.00 a	Susceptible
BASF BX 2296B3XF	100.00 a	Susceptible
BASF BX 2297B3XF	100.00 a	Susceptible
NexGen NG 3195 B3XF	100.00 a	Susceptible
NexGen NG 4190 B3XF	100.00 a	Susceptible
NexGen NG 5150 B3XF	100.00 a	Susceptible
PhytoGen PX1125A221-04W3FE	100.00 a	Susceptible
Brownfield Seed and Delinting BS&D Ton Buster Magnum	100.00 a	Susceptible
PhytoGen PX1124A222-04W3FE	95.00 a	Susceptible
Brownfield Seed and Delinting BS&D Ton Buster Elite	86.25 b	Moderate Susceptible
BASF ST 4595B3XF	85.00 b	Moderate Susceptible
Deltapine DP 2123 B3XF ck	62.50 c	Partial Susceptible
BASF BX 2298B3XF	26.25 d	Partial Resistant
Deltapine DP 1646 B2XF ck	23.75 d	Partial Resistant
Brownfield Seed and Delinting BS&D 9X	10.00 e	Resistant
Texas A&M LUB 16-2-418BB	8.75 ef	Resistant
Brownfield Seed and Delinting BS&D 224	6.25 efg	Resistant
Deltapine DP 2012 B3XF	5.00 efg	Resistant
NexGen NG 4050 XF	3.75 efg	Resistant
NexGen NG 3299 B3XF	2.50 fg	Resistant
NexGen NG 5711 B3XF	2.50 fg	Resistant
PhytoGen PX1130A329-04W3FE	2.50 fg	Resistant
PhytoGen PX1140A383-04W3FE	2.50 fg	Resistant
PhytoGen PX1150A452-04W3FE	2.50 fg	Resistant
Deltapine DP 2020 B3XF	1.25 g	Resistant
Deltapine DP 2022 B3XF	1.25 g	Resistant
PhytoGen PX 1122A214-04W3FE	1.25 g	Resistant
PhytoGen PX1150A453-04W3FE	1.25 g	Resistant
NexGen NG 3930 B3XF	0.75 g	Resistant
Deltapine DP 2044 B3XF	0.00 g	Resistant
Gowan Seed Company GS 1432	0.00 g	Resistant
Gowan Seed Company GS 701	0.00 g	Resistant
NexGen NG 4098 B3XF	0.00 g	Resistant
PhytoGen PX1122A213-04W3FE	0.00 g	Resistant
PhytoGen PX1140A385-04W3FE	0.00 g	Resistant
PhytoGen PX1150A450-04W3FE	0.00 g	Resistant
Prob>F	0.0001	
MSD[1] (0.05)	7.03	

[1]MSD is minimum significant difference (P=0.05).

Table 6. Percentage of varieties that are susceptible to bacterial blight from cotton seed companies.

Brand name	Transgenics	% Susceptible to blight	Number of Varieties
Armor (AR)	B2XF	100	4
Armor (AR)	B3XF	33	6
DynaGro (DG)	B2XF or GLTP	50	6
DynaGro (DG)	B3XF	61	18
Deltapine (DP)	XF or B2XF	67	9
Deltapine (DP)	B3XF	40	20
FiberMax (FM)	All	10	10
NexGen (NG)	XF or B2XF	50	10
NexGen (NG)	B3XF	45	11
Phytogen (PHY)	W3FE	0	19
Stoneville (ST)	All	67	9

Summary

Cultivar selection remains the most important component in managing Verticillium wilt and bacterial blight. While there are many available cultivars with resistance to bacterial blight, there are much fewer cultivars that can limit Verticillium wilt severity and yield well in Verticillium wilt fields.

Acknowledgements

We appreciate the funding from Texas Cotton State Support, and the Plains Cotton Improvement Program. We also appreciate the assistance from cotton producers Glen Schur, Ron Graves, and Larry Smith.